

Tribhuvan University
Institute of Science and Technology
Model Question Paper

Bachelor Level/ First Year/ Second Semester/ Science
Computer Science and Information Technology (CSC. 154)
(Data Structure and Algorithm)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Section A

Attempt any TWO questions.

(2x10=20)

1. Describe using an example, how an arithmetic expression can be represented using a binary tree. Once represented, how can the expression be output in postfix notation?
2. Define stack as an ADT. Explain the condition that is to be checked for Push and Pop operations when stack is implemented using array?
3. Explain the advantages and disadvantages of representing a group of items as an array versus a linear linked list with suitable examples.

Section B

Attempt any EIGHT questions.

(8x5=40)

4. Explain the difference between structure and union.
5. What is Big-O notation? Analyze the efficiency of quick sort.
6. Determine what the following recursive C function computes. Write an iterative function to accomplish the same purpose.

```
int func(int n)
{
    if (n==0)
        return (0);
    return (n+func(n-1));
} /*end func*/
```

7. Explain the concept of priority queue with an example.
8. Illustrate the sequential search with suitable example.
9. Write a non recursive depth-first traversal algorithm.
10. Write and explain the algorithm for Tower of Hanoi.
11. What is hashing? Explain the terms hash collision.
12. Explain why the straight selection sort is more efficient than the bubble sort.
13. Explain different types of binary tree.

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Section A

Attempt any Two questions:

(2x10=20)

1. What do you mean by binary tree? Explain the two binary search tree with example.
2. What do you mean by Recursion? Explain the implementation of factorial and Fibonacci sequences with example.
3. Explain the implementation of stack and queue with example.

Section B

Attempt any Eight questions:

(8x5=40)

4. What are the differences between two dimension array and multidimensional array?
5. What are the major characteristics of algorithms?
6. How can you convert from infix to post fix notation?
7. How can you use Queue as ADT?
8. What is post-order traversal?
9. What is sorting? Describe the insertion.
10. Explain the binary searching.
11. Differentiate between Pre-order and In-order traversal.
12. Explain the tower of Hanoi algorithm.
13. Explain the Kruskal's algorithm.

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Section A

Attempt any two questions.

(2x10=20)

1. Write a Menu program to demonstrate the simulation of stack operations in array implementation.
2. State relative merits and demerits of contiguous list and Linked list. Explain the steps involved in inserting and deleting a node in singly linked list.
3. A binary tree T has 12 nodes. The in-order and pre-order traversals of T yield the following sequence of nodes:
In-order : VPNAQRSOKBTM
Pre-order: SPVQNARTOKBM

Section B

Attempt any eight questions.

(8x5=40)

4. Consider the function:
Void transfer (int n, char from, char to, char temp)
{ if (n>0)
 { transfer (n-1, from, temp, to);
 Print ("In Move Disk %d from %C to %C" N, from, to);
 Transfer (n-1, temp, to, from);
 }
Trace the output with the function call:
Transfer (3, 'R', 'L', 'C');
5. "To write an efficient program, we should know about data structures." Explain the above statement.
6. Write C function to display all items in a circular queue in array implementation. Write assumptions, you need.
7. Explain Divide and conquer algorithm taking reference to merge sort.
8. Trace Binary Search algorithm for the data:
21, 36, 56, 79, 101, 123, 142, 203
And Search for the values 123 and 153.

9. Differentiate between tree and graph. What are spanning tree. Explain MST (Minimum cost Spanning Tree) problem.
10. A file containing 100 symbols in which following alphabets with their probability of occurrence. Build a Huff man tree according to Greedy strategy.
11. Explain the use of Big-on notation in analyzing algorithms. Compare sorting time efficiencies of Quick-Sort and Mergo-Sort.
12. Explain CLL, DLL, DCLL (Circular, Doubly, Doubly Circular Linked List).
13. Write short notes on (any two):
 - A) Hash function
 - B) External sorting
 - C) ADT.

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Section A

Attempt any two questions.

(2x10=20)

1. Define stack as ADT. Describe its primitive operations on Array implementation and linked list implementation.
2. Describe properties of Binary Search Tree. Write recursive algorithms for constructing BST and its traversals. Illustrate them with an example.
3. What are external and internal sorting? Explain partition strategies of Merge sort and Quick sort. Trace these sort algorithms for following data:
11 45 61 33 55 9 83 25

Section B

Attempt any eight questions.

(8x5=40)

4. Write recursive algorithm to get Fibonacci term. Illustrate it drawing recursion tree.
5. Construct an expression tree from the following postfix:
AB + C*DC – -FG + \$
6. Differentiate between Singly linked list, DLL, CLL and DCLL.
7. Describe circular Queue operations in array implementation.
8. Compare and Contrast between Binary searching and Binary tree searching.
9. State collision resolution techniques in hashing. Explain double hashing and quadratic probing techniques.
10. State MST (Minimum Cost Spanning Tree) problem and shortest path (single source and all other destination) problem. Name the algorithms for solving these problems.
11. Justify the statement: "To write an efficient program, we should know about data structures and algorithms".
12. Discuss the merits and demerits of contiguous list and linked list.
13. What is priority queue? How is it best implemented?